

**Bacterial Gastroenteritis Escherichia coli 0157**  
**and**  
**Salmonella enteritidis**  
**And**  
**Campylobacter jejuni**

# Escherichia coli infection

- Many serotypes of E. coli constitute part of the human gut microbiome.
- Clinical disease requires either colonization with a new or previously unrecognized strain, or the acquisition by current colonizing bacteria.
- Travel to unfamiliar areas of the world allows contact with different strains of endemic E. coli and the development of travelers' diarrhoea.
- Enteropathogenic strains may be found in the gut of healthy individuals and, if these people move to a new environment, close contacts may develop symptoms.
- At least five different clinico-pathological patterns of diarrhoea are associated with specific strains of E. coli with characteristic virulence factors.

# Escherichia coli infection

## ❖ Enterotoxigenic E. coli :-

- Enterotoxigenic E. coli (ETEC) is the most common cause of travelers' diarrhoea.
- Other causes of travelers' diarrhoea:-
  - Shigella spp.
  - Campylobacter jejune.
  - Salmonella serovars
  - Plesiomonas shigelloides.
  - Non-cholera Vibrio spp.
  - Aeromonas spp.
- The organisms produce either a heat-labile or a heat-stable enterotoxin, causing marked secretory diarrhoea and vomiting after 1–2 days' incubation.
- The illness is usually mild and self-limiting after 3–4 days.
- Antibiotics are of questionable value.

# Escherichia coli infection

## ❖ Enteroinvasive E. coli :-

- Illness caused by enteroinvasive E. coli (EIEC) is very similar to Shigella dysentery.
- Is caused by invasion and destruction of colonic mucosal cells.
- No enterotoxin is produced.
- Acute watery diarrhoea, abdominal cramps and some scanty blood-staining of the stool are common.
- The symptoms are rarely severe and are usually self-limiting.

# Escherichia coli infection

## ❖ Enteropathogenic E. coli :-

- Enteropathogenic E. coli (EPEC) organisms are very important in infant diarrhoea.
- They are able to attach to the gut mucosa, inducing :-
  - ✓ A specific 'attachment and effacement' lesion.
  - ✓ Causing destruction of microvilli.
  - ✓ Disruption of normal absorptive capacity.
- The symptoms vary from mild non-bloody diarrhoea to quite severe illness, but without bacteraemia.

# Escherichia coli infection

## ❖ Enter-aggregative E. coli :-

➤ Enter-aggregative E. coli (EAEC) strains:-

✓ Adhere to the mucosa.

✓ Produce a locally active enterotoxin.

✓ Demonstrate a particular 'stacked brick' aggregation to tissue culture cells when viewed by microscopy.

➤ Associated with prolonged diarrhoea in children.

# Escherichia coli infection

## ❖ Enterohaemorrhagic E. coli :-

- A number of distinct 'O' serotypes of E. coli possess both the genes necessary for adherence.
- Plasmids encoding two distinct enterotoxins, which are identical to the toxins produced by Shigella ('shiga toxins 1 and 2').
- E. coli O157:H7 is perhaps the best known of these verotoxin-producing E. coli (VTEC).
- The incidence of enterohaemorrhagic E. coli (EHEC) is considerably lower than that of Campylobacter and Salmonella infection, it is increasing in the developing world.
- The reservoir of infection is in the gut of herbivores.

# Escherichia coli infection

## ❖ Enterohaemorrhagic E. coli :-

- The organism has an extremely low infecting dose (10–100 organisms).
- Runoff water from pasture lands where cattle have grazed, which is used to irrigate vegetable crops, as well as contaminated milk, meat products (especially hamburgers that have been incompletely cooked), lettuce, radish shoots and apple juice have all been implicated as sources.
- The incubation period is between 1 and 7 days.
- Initial watery diarrhoea becomes uniformly blood-stained in 70% of cases and is associated with severe abdominal pain.
- There is little systemic upset, vomiting or fever.



# Escherichia coli infection

## ❖ Enterohaemorrhagic E. coli :-

- Enterotoxins have both a local effect on the bowel and a distant effect on particular body tissues, such as glomerular apparatus, heart and brain.
- The potentially life-threatening hemolytic uraemic syndrome occurs in 10–15% of sufferers from this infection, arising 5–7 days after the onset of symptoms.
- It is most likely at the extremes of age, may be induced, particularly in children, by antibiotic therapy.
- HUS is treated by dialysis if necessary and may be averted by plasma exchange.
- Antibiotics should be avoided since they can stimulate toxin release.

# Salmonella enteritidis

- **Salmonella enterica serovars other than Salmonella Typhi and Paratyphi, can cause gastroenteritis.**
- **Are widely distributed throughout the animal kingdom.**
- **Two serovars are most important worldwide:**
  - ✓ **Salmonella Enteritidis phage type 4.**
  - ✓ **Salmonella Typhimurium dt.104.**
- **The latter may be resistant to commonly used antibiotics such as ciprofloxacin.**

# Salmonella enteritidis

- Some strains have a clear relationship to particular animal species.
- Transmission is by contaminated water or food, direct person-to-person spread or the handling of exotic pets such as salamanders, lizards or turtles.
- The incidence of Salmonella enteritis is falling in the UK due to an aggressive culling policy in broiler chicken stocks, coupled with vaccination.
- The incubation period of Salmonella gastroenteritis is 12–72 hours.
- The predominant feature is diarrhoea, sometimes with passage of blood.
- Vomiting may be present at the outset.

# Salmonella enteritidis

- Approximately 5% of cases are bacteraemic and invasive nontyphoidal salmonellosis is a leading cause of bacteraemia in sub-Saharan Africa.
- Reactive (post-infective) arthritis occurs in approximately 2%.
- Antibiotics are not indicated for uncomplicated Salmonella gastroenteritis but are prescribed for bacteraemia.
- Salmonellae are notorious for persistent infection and can seed endothelial surfaces such as an atherosclerotic aorta.
- Mortality, as with other forms of gastroenteritis, is higher in the elderly.

# **Campylobacter jejuni infection**

- This infection is essentially a zoonosis, although contaminated water may be implicated, as the organism can survive for many weeks in fresh water.
- The most common sources of the infection are chicken, beef and contaminated milk products.
- Pet puppies have also been sources.
- Campylobacter infection is now the most common cause of bacterial gastroenteritis in the UK, accounting for some 100 000 cases per annum, most of which are sporadic.
- The incubation period is 2–5 days.

# Campylobacter jejuni infection

- Colicky abdominal pain may be severe and mimic acute appendicitis or other surgical pathology.
- Nausea, vomiting and significant diarrhoea, frequently containing blood, are common features.
- The majority of Campylobacter infections affect fit young adults and are self-limiting after 5–7 days.
- About 10–20% will have prolonged symptomatology, occasionally meriting treatment with a macrolide, most often azithromycin, as many organisms are resistant to ciprofloxacin.
- Approximately 1% of cases will develop bacteraemia and possible distant foci of infection.
- Campylobacter spp. have been linked to Guillain–Barré syndrome and post-infectious reactive arthritis.

GOOD Luck